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# मानक

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IS 9175-28 (1987): Rationalized Steels for Automobile and Ancillary Industry, Mechanical and Physical Properties - Part 28 40Ni6Cr4Mo3 Grade steel [MTD 16: Alloy Steels and Forgings]



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IS : 9175 ( Part 28 ) - 1987

*Indian Standard*

SPECIFICATION FOR  
RATIONALIZED STEELS FOR THE  
AUTOMOBILE AND ANCILLARY INDUSTRY

PART 28 MECHANICAL AND PHYSICAL PROPERTIES  
OF 40Ni6Cr4Mo3 GRADE STEEL

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BUREAU OF INDIAN STANDARDS  
MANAK BHAYAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

*Indian Standard*

# SPECIFICATION FOR RATIONALIZED STEELS FOR THE AUTOMOBILE AND ANCILLARY INDUSTRY

## PART 28 MECHANICAL AND PHYSICAL PROPERTIES OF 40Ni6Cr4Mo3 GRADE STEEL

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## *Indian Standard*

# SPECIFICATION FOR RATIONALIZED STEELS FOR THE AUTOMOBILE AND ANCILLARY INDUSTRY

## PART 28 MECHANICAL AND PHYSICAL PROPERTIES OF 40Ni6Cr4Mo3 GRADE STEEL

### 0. FOREWORD

**0.1** This Indian Standard ( Part 28 ) was adopted by the Bureau of Indian Standards on 25 September 1987, after the draft finalized by the Co-ordinating Committee on Materials for Automobiles had been approved by the Structural and Metals Division Council.

**0.2** Part 1 of this standard was published in 1979 which covers the chemical composition of 33 rationalized steels. The mechanical properties, hardenability and isothermal transformation characteristics of these 33 rationalized steels are being covered in different parts of this standard ( Parts 2 to 34 ). The data concerning these properties given in this standard is only for guidance and information purposes.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2 - 1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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### 1. SCOPE

**1.1** This standard ( Part 28 ) covers the mechanical properties, hardenability and isothermal transformation characteristics of 40Ni6Cr4Mo3 grade steel for use by automobile and ancillary industry.

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\*Rules for rounding off numerical values ( *revised* ).

## 2. CHEMICAL COMPOSITION

2.1 The chemical composition of this grade of steel shall be as given below:

Constituents, Percent							
C	Si	Mn	Ni	Cr	Mo	S	P
0.35-0.44	0.10-0.35	0.40-0.70	1.25-1.75	0.90-1.30	0.20-0.35	0.035 Max	0.035 Max

## 3. HARDNESS

3.1 The maximum hardness for this grade of steel delivered in the annealed condition when determined in accordance with IS : 1500-1983\* shall be 277 HB.

## 4. MECHANICAL PROPERTIES

4.1 The mechanical properties of this grade of steel in the hardened and tempered condition when determined in accordance with IS : 1598 - 1977† and IS : 1608-1972‡ shall be as given in Table 1.

TABLE 1 MECHANICAL PROPERTIES IN HARDENED AND TEMPERED CONDITION

LIMITING RULING SECTION	TENSILE STRENGTH	0.2 PERCENT PROOF STRESS, Min	ELONGATION G.L. $5.65 \sqrt{S_0}$ , Min, PERCENT	IZOD IMPACT, Min Joules	HARDNESS HB
(1)	(2)	(3)	(4)	(5)	(6)
mm	MPa	MPa			
150	800- 950	600	16	55	229-277
150	900-1 050	700	15	55	255-311
100	1 000-1 150	800	13	48	285-341
63	1 100-1 250	880	11	41	311-363
30	1 200-1 350	1 000	10	30	341-401
30	1 550, Min	1 300	6	11	444, Min

## 5. HOT WORKING AND HEAT TREATMENT TEMPERATURES

5.1 The recommended hot working and heat treatment temperatures shall be as given below:

Forging/rolling temperature	1 200°C
Annealing temperature	820-850°C
Process annealing temperature	650°C
Hardening temperature	830-850°C
Tempering temperature	150-200°C } Depending on the 500-660°C } properties required.

\*Method for Brinell hardness test for metallic materials ( second revision ).

†Method for izod impact test of metals ( first revision ).

‡Method for tensile testing of steel products ( first revision ).



## 6. TRANSFORMATION CHARACTERISTICS

**6.1** The isothermal transformation diagrams for this grade of steel are given in Fig. 1

## 7. HARDENABILITY

**7.1** The end quench hardenability curve is given in Fig. 2.

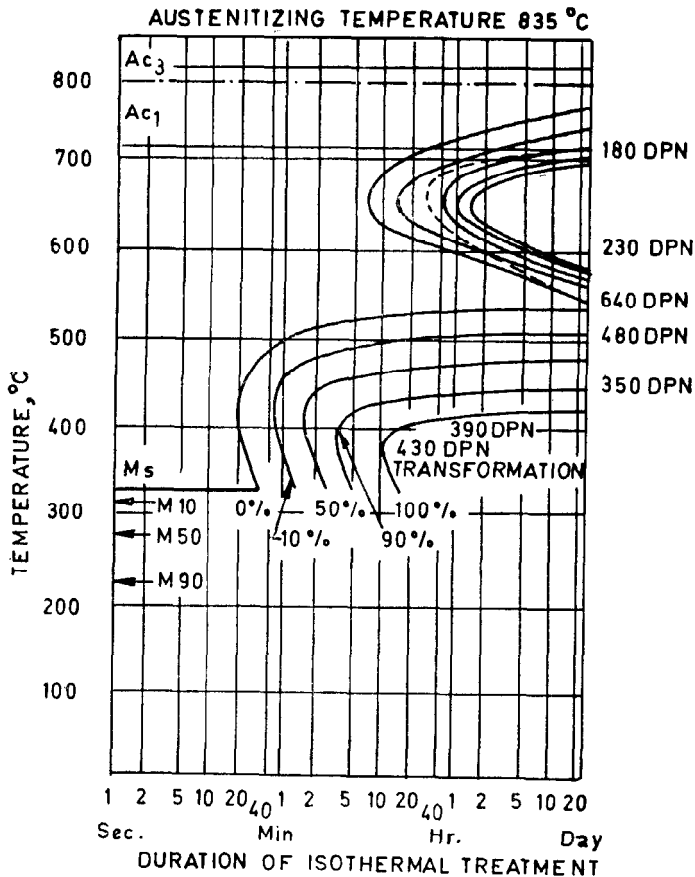
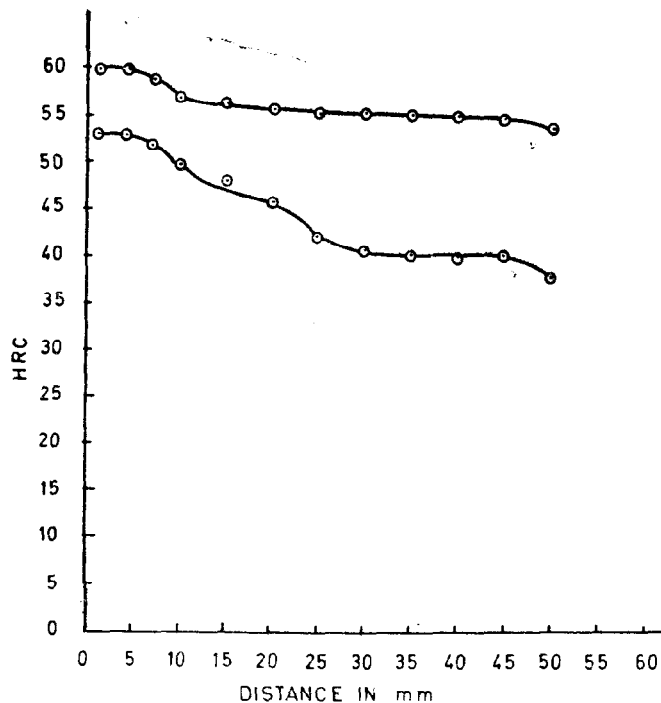


FIG. 1 ISOTHERMAL TRANSFORMATION DIAGRAM OF 40Ni6Cr4Mo3 GRADE STEEL



DISTANCE IN mm	1	2	3	4	5	6	7	8	9	10	15	20	25	30	35	40	45	50
HRC Max	60	60	60	60	59	58.5	58	58	57.5	57	56.5	56	55.5	55.5	55.5	55.5	55.5	54
HRC Min	53	53	53	53	52	52	51.5	51	50.5	50	48	46	42.5	41	41	41	41	38

FIG. 2 END QUENCH HARDENABILITY TEST DATA FOR 40Ni6Cr4Mo3 GRADE STEEL

## 8. EFFECT OF TEMPERING ON MECHANICAL PROPERTIES

8.1 The curves for effect of tempering on the mechanical properties of the steel are given in Fig. 3.

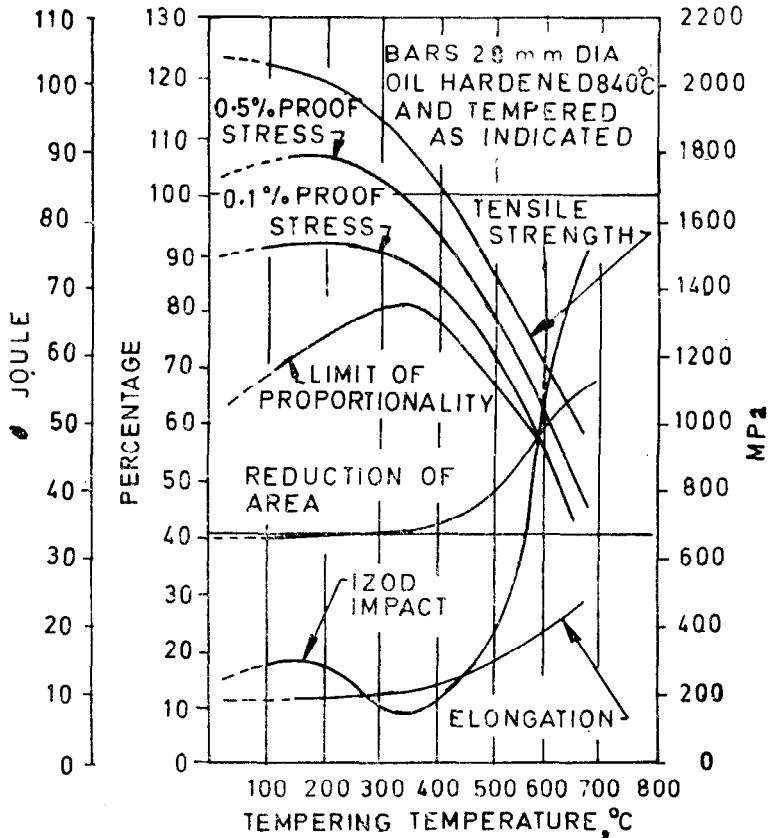


FIG. 3 CURVES SHOWING THE EFFECT OF TEMPERING TEMPERATURE ON MECHANICAL PROPERTIES OF 40Ni6Cr4Mo3 GRADE STEEL.

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